*mia simplex* offers a unique and easily accessible structure for the study of calcification and mineralization in molluscs. The rigid byssal attachment system of the anomiids is composed of a slightly recurved, elongated pillar that extends from a modified foot through a byssal notch in the right valve to a flared attachment plaque. The upper portion of the byssus, otherwise enclosed by a basal, cup-shaped portion of the foot, consists of a series of parallel lamellae that run along the long axis of the byssus. These calcified lamellae are produced within a series of secretory folds or leaflets composing the cup-shaped pedal region. Each lamella is formed within a single fold. Lamellae terminate near the base of the byssus and gradually conform to a relatively smooth plaque sector. The basal plaque, superficially smooth with only small pores and infrequent pitting disturbing this smoothness, gradually spreads over and is firmly attached to the substratum. The plaque has similar microstructural qualities as the lamellae but not in the form of distinct sheets. The external microstructure of both often appears as a series of spindle shaped granules lying obliquely to the byssal long axis. These spindle shaped packets are reminiscent of similar structures found in other, relatively simple calcified systems and may be revealing a consistent and widespread means of inorganic deposition.

**THE MICROSTRUCTURE OF NORMAL AND REGENERATED SHELL IN *TEGULA* (ARCHAEOGASTROPODA).** **Charlene Reed-Miller,** Florida State University, Tallahassee.

Shells from five species of the marine snail *Tegula* were examined by scanning electron microscope to determine the ultrastructure and orientation of shell layers. Four shell layers were identified, each with some variation in the microstructure among the species of snails. Shell regeneration was initiated by cutting a 4mm$^2$ window in the first body whorl of the snails. The regenerated shell was observed by scanning electron microscopy and energy dispersive X-ray analysis. Newly regenerated shell appeared as small (1 $\mu$m) doubly-pointed crystallites. These crystallites increased in size and coalesced until a thin, layered sheet of calcium carbonate filled the window, approximately 35 days after shell injury. There is a great dissimilarity in the microarchitecture between normal and regenerated shell in *Tegula.* The differences in crystal type are probably correlated with the rate of shell deposition. Supported by grant No. DE05491 from the National Institute of Health.

**X-RAY MICROANALYSIS OF OYSTER MANTLE: CALCIUM TRANSPORT.** **Lyle Walsh,** Department of Physiology, University of California, Los Angeles.

The shell of molluscs is made by the outer epithelium of the mantle. These cells secrete and modify the extrapallial fluid from which shell matrix and mineral are formed. Constituents of the extrapallial fluid are regulated by mantle transport processes.

Mantle from the American oyster *Crassostrea virginica* was quench frozen, freeze substituted and embedded in resin. One micron thick sections were cut and etched. Subcellular regions were localized and analyzed by x-ray microanalysis.

The results indicate: 1) Na and Cl are removed from the cell 2) K, Mg, and Zn are concentrated from seawater 3) S and P are accumulated 4) Ca is located uniformly over most of the cell 5) Ca is concentrated along the microvilli and 6) no Ca granules occur in the mantle.

Several theories of trans-epithelial Ca transport can be ruled out. Electro-chemical diffusion cannot lead to extrapallial Ca accumulation because the sustaining potential would be shunted to seawater. Ion selective intercellular junctions would not provide a transport pathway because no increase of Ca was found in the intercellular spaces. Since mitochondria did not accumulate Ca, Lehninger's model of Ca transport is ruled out.

Ca transport across outer mantle epithelium is restricted to 1) Na/Ca exchange 2) Ca-ATPase pump 3) secretion of proteins with bound Ca; all across the apical membrane. Ca accumulations along the microvilli may be precipitate on newly formed matrix nucleation sites.

**HETEROGENEOUS DISTRIBUTION OF TRACE AND MINOR ELEMENTS IN SHELL OF THE OYSTER, AN HYPOTHESIS.** **Melbourne R. Carriker,** College of Marine Studies, University of Delaware, Lewes, **Charles P. Swann,** Bartol Research Foundation of the Franklin Institute, University of Delaware, Newark, and **Robert S. Prezant,** Department of Biology, University of Southern Mississippi, Hattiesburg.

The distribution of 16 elements studied by us in valves of *Crassostrea virginica* with a proton microprobe is conspicuously heterogeneous, not only within one but also among different mineralogical types of shell, confirming observations by Immega (1976) with AAS in the valves of *C. gigas* and *Ostrea lurida*. He suggested that many elements present in valves come from particles of "contaminated" inorganic detritus incorporated in the shell at the mantle edge during shell formation. Our study of the activity of the part of the living mantle ventral to the adductor muscle, and scanning electon microscopy of prismatic shell formation at the periphery of the valves in *C. virginica* support Immega's suggestion. Mantle lobes ventral to the adductor muscle are muscularly active and highly contractile, so that not only mantle margins but also extrapallial surfaces of the mantle epithelium are exposed to particles suspended in seawater. Furthermore the organic film (that precedes shell formation) secreted by the mantle edge appears highly viscid and probably readily adsorbs microscopic particles suspended in seawater circulated through the mantle cavity.